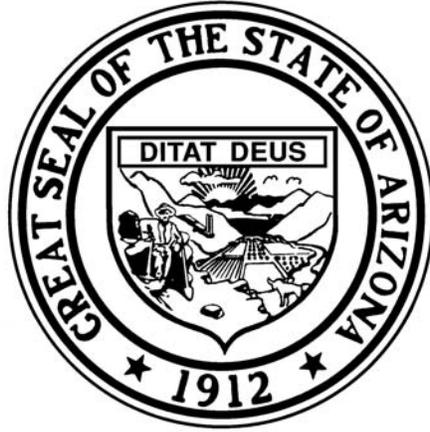


INCIDENCE AND REPORTED CAUSES OF STILLBIRTHS

SECOND ANNUAL REPORT MAY 2006

Arizona Department of Health Services
Public Health Prevention Services
Office of Women's and Children's Health
Assessment and Evaluation Section





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INCIDENCE AND REPORTED CAUSES OF STILLBIRTHS ANNUAL REPORT 2004

BACKGROUND

Pursuant to Arizona law (ARS36-2291), the first annual report on the Incidence and Reported Causes of Stillbirths was completed in May of 2005. The report analyzed data from the 2003 calendar year, as it was the most recent available data at the time. The findings of the report on stillbirths from 2003 were presented to the Unexplained Infant Death Council. Due to the small number of stillbirths reported (n=539) and data issues that were identified, the Council recommended that, for the second annual report, five years of data be combined to provide a more powerful result.

The analysis conducted for this report confirmed the findings from the first annual report. The overall stillbirth rate, rates by race, ethnicity, maternal age and education status were all similar to rates found in the analysis of 2003 data. Additionally, the same data quality issues were observed in the 2000 through 2004 combined data as in the 2003 dataset.

METHODOLOGY

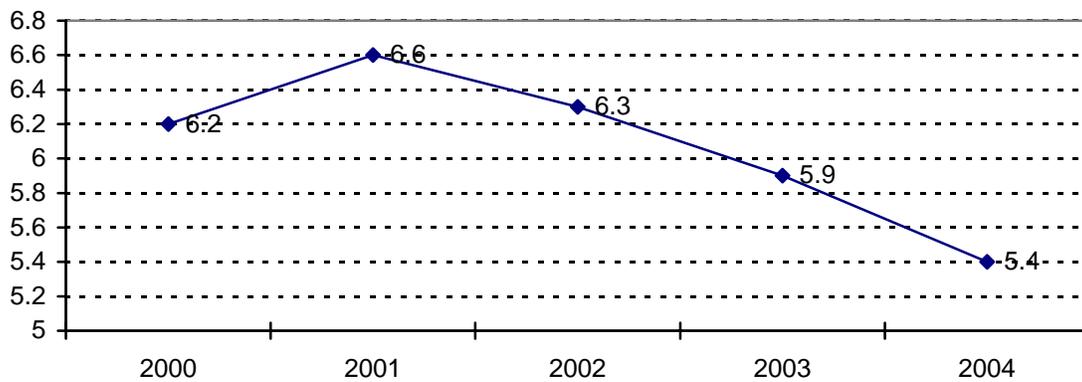
Arizona electronic fetal death certificate data for deaths occurring between January 1, 2000 and December 31, 2004 were summarized in this report. To conduct the analysis, one electronic file was created merging data from all five years. Data was obtained from files generated by the Health Status and Vital Statistics Section of the Bureau of Public Health Statistics within the Arizona Department of Health Services. These files contain only data on stillbirths that were reported to occur at or after 20 weeks of age according to the estimated gestational age, and/or weighed at least 350 grams at birth from the fetal death certificate.

This report focuses on the incidence and reported causes of stillbirths. Both the number of deaths (incidences) and rates are included. Stillbirth rates are useful when looking at trends over time, comparing one population to another or comparing subgroups within a population. In this report, live births and fetal deaths are used as a proxy estimate of pregnancies (excluding induced abortions) that are at risk for a fetal loss. Stillbirth rates are expressed as the number of deaths per 1,000 live births and fetal deaths. Stillbirth rates are presented in this paper by race/ethnicity, maternal age, education level and county of occurrence.

ARIZONA 2000 - 2004

From January 1, 2000 through December 31, 2004, there were a total of 2,698 stillbirths reported to have occurred at 20 weeks or more gestation that weighed at least 350 grams at birth in the Arizona Vital Records Fetal Death Certificate database. Figure 1 shows that the stillbirth rate ranged from 6.6 per 1,000 live births and fetal deaths in 2001 to a low of 5.4 in 2004. The stillbirth rate in Arizona for the combined five-year period was 6.1 per 1,000 live births and fetal deaths, which is similar to the U.S. rate of 6.6 per 1,000 in 2000.¹

Figure 1. Stillbirth Rates, Arizona 2000-2004
(per 1,000 live births + fetal deaths)

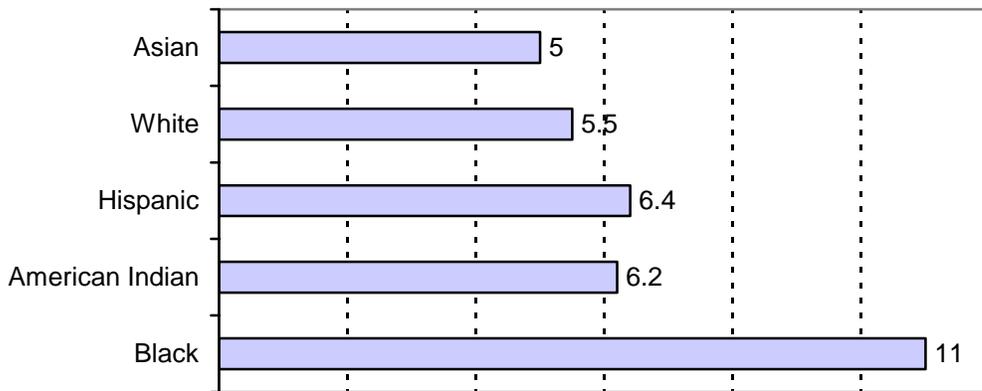


RACE/ETHNICITY

Figure 2 shows the stillbirth rates by race/ethnicity for the 2000 through 2004 time-period in Arizona. Stillbirth rates by race/ethnicity for the combined dataset showed the same pattern seen in the 2003 data in that Hispanic, American Indian, and Black women experienced higher stillbirth rates than Asian and White women. Stillbirth rates ranged from a low of 5.0 for Asian women to a high of 11.0 per 1,000 live births and fetal deaths for Black women.

¹ Centers for Disease Control and Prevention. Morbidity and Mortality Weekly. Vol 53, 24 June 24, 2004. Internet: <http://www.cdc.gov/mmwr/pdf/wk/mm5324.pdf> (Accessed 08/10/2005)

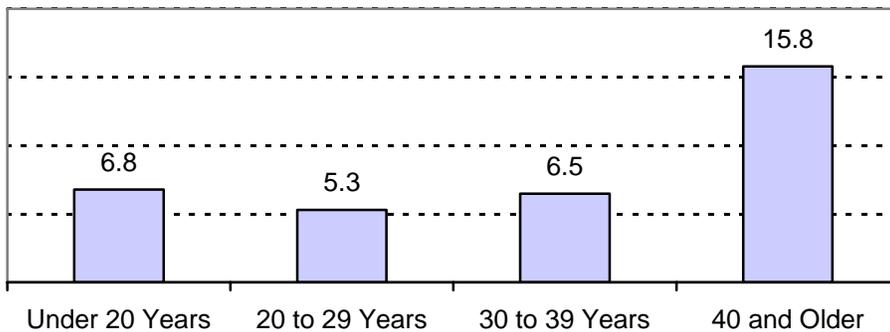
Figure 2. Stillbirth Rates by Race/Ethnicity, Arizona 2000-2004
(per 1,000 live births + fetal deaths)



MATERNAL AGE

As was shown in the report on stillbirths occurring in 2003, the risk of experiencing a stillbirth was highest for women 40 years of age and older (15.8 per 1,000 live births and fetal deaths). For these older women, the risk was nearly three times that of women in their twenties. Figure 3 shows the stillbirth rates for four age groupings.

Figure 3. Stillbirth Rates by Maternal Age, Arizona 2000-2004
(per 1,000 live births + fetal deaths)

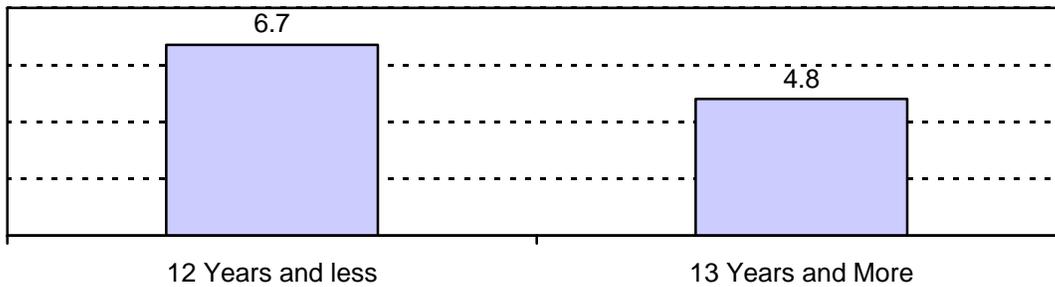


MATERNAL EDUCATION

Figure 4 below shows the stillbirth rates by level of maternal education. Once again, this graph looks similar to the one presented in the paper on stillbirths occurring in 2003 in that women with 12 years of education or less experienced

higher rates of stillbirths (6.7 per 1,000 births and fetal deaths) than women with 13 years or more of education (4.8 per 1,000).

**Figure 4. Stillborn Death Rates by Level of Education,
Arizona 2000-2004**
(per 1,000 live births + fetal deaths)

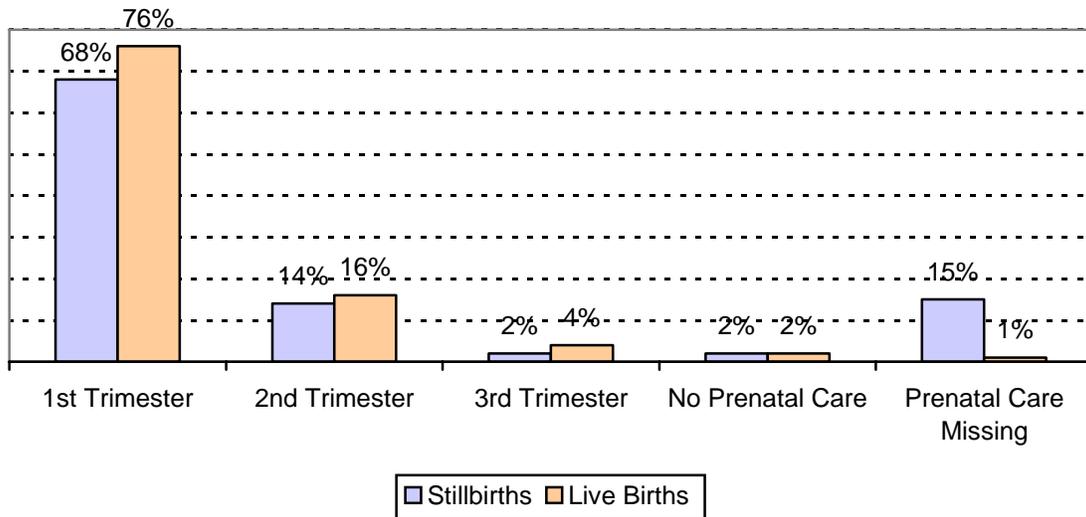


PRENATAL CARE

Determining the adequacy of prenatal care in stillbirths through a review of fetal death certificate data is complicated. Like birth certificate data, fetal death certificate data do not contain any information on the quality or content of prenatal care. Methodologies for determining adequacy of prenatal care in live births, such as the Kotelchuck index, look at both the timing of entry into care and the number of prenatal visits received. While these same methods can be applied to fetal death certificate data, “adequacy of care”, in terms of the number of expected visits, may be different for women at risk of experiencing a stillbirth. If a woman enters prenatal care early and a risk factor is identified, she may appropriately receive more care than a woman without an identified risk factor. On the other hand, women who receive no prenatal care may be at higher risk for delivering a stillborn infant. Because of the difficulty in interpreting adequacy of prenatal care measures for fetal deaths, the results will not be presented in this report.

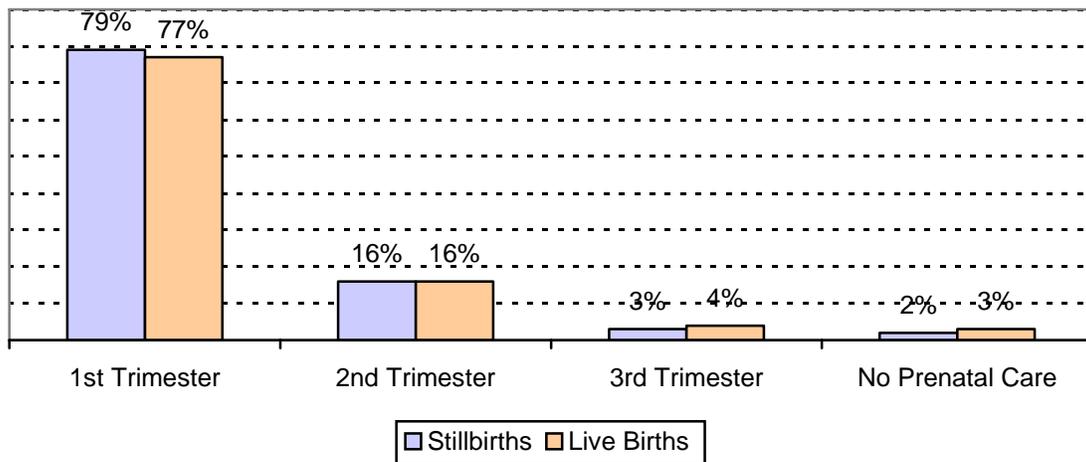
Figure 5 illustrates a comparison between entry into prenatal care for women experiencing stillbirths and entry into prenatal care for women giving birth to live infants during 2000 through 2004. Women experiencing stillbirths seemed to enter prenatal care later than women giving birth to live infants. However, 15 percent of the stillbirth cases were missing data in the field used to determine trimester of entry into prenatal care.

**Figure 5. Percent of Women Entering Prenatal Care by Trimester
Arizona 2000-2004
For Live and Stillbirths**



In a similar analysis, the cases where month of entry into prenatal care was unknown or missing were removed. Figure 6 shows that, when these cases are excluded, timing of entry into prenatal care looks very similar for mothers of stillborns and mothers delivering live infants. Given the limitations of the data, it is not clear if timing of entry into prenatal care is different between the two groups.

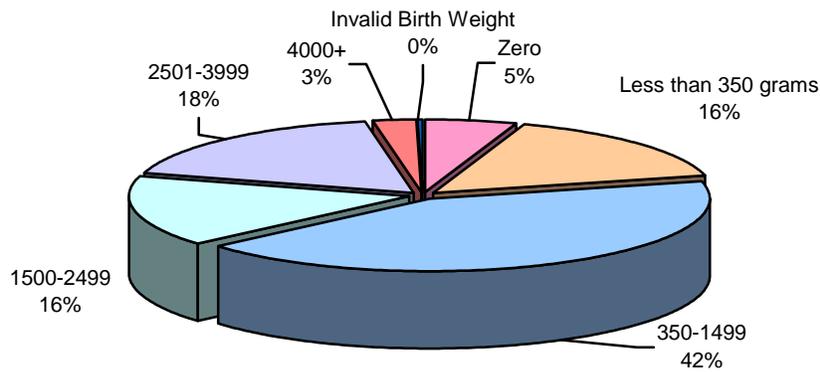
**Figure 6. Percent of Women Entering Prenatal Care by Trimester,
Arizona 2000-2004
For Live and Stillbirths
Recalculated Without Unknowns**



REPORTED WEIGHT OF STILLBIRTHS

Most studies looking at fetoinfant mortality limit their studies to stillbirths and infants that were carried to at least 20 weeks gestation and a minimum weight ranging from 350 grams to 500 grams.² Figure 7 below shows the reported weights for stillbirths reported to be at least 20 weeks gestation from 2000 through 2004. Forty-two percent of stillbirths were reported to weigh between 350 to 1,499 grams, and 16 percent weighed between 1,500 and 2,499 grams. Five percent of stillbirths were reported to have a weight of zero grams and another 16 percent were reported to weigh less than 350 grams. Most fetuses that survive to 20 weeks gestation weigh over 350 grams.³ Therefore, while some of these fetuses may have indeed weighed less than 350 grams, it is likely that some of the reported weights of less than 350 grams were data errors.

Figure 7. Reported Weight of Stillbirths, Arizona 2000-2004



COUNTY OF OCCURRENCE AND AUTOPSY RATES

Autopsies sometimes provide information on cause of death. One of the recommendations made by the Unexplained Infant Death Council for the second annual report was to review the percent of stillbirths that were autopsied by county of stillbirth occurrence. During the five-year time-period of 2000 through 2004, the majority of stillbirths occurred in Maricopa County (69 percent). Fifteen percent of stillbirths occurred in Pima County and the remaining 16 percent occurred in 13 of the other Arizona counties.

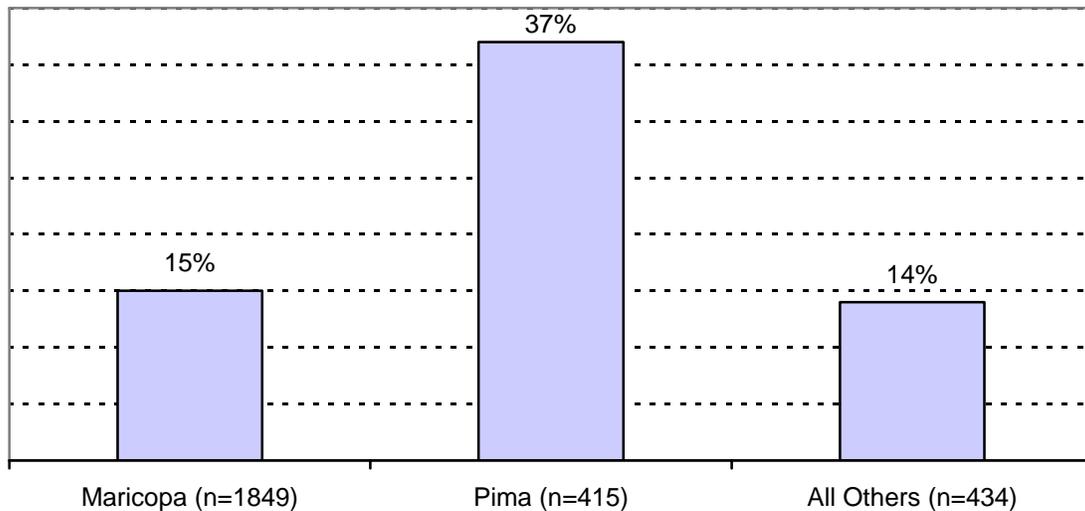
Figure 8 shows the proportion of stillbirths autopsied for Maricopa, Pima, and all other counties combined. Although Maricopa County reported the largest number of stillbirths, Pima County had a higher percentage of autopsies (37

² Perinatal Periods of Risk Approach “How To Do” Workshop Materials, Analytic Guide, Draft 5 p22-26

³ Alexander, Greg et.al. A United States National Reference for Fetal Growth. Journal of Obstetrics and Gynecology, 1996 87:2 p163-168

percent) than Maricopa County (15 percent) and all other counties combined (14 percent).

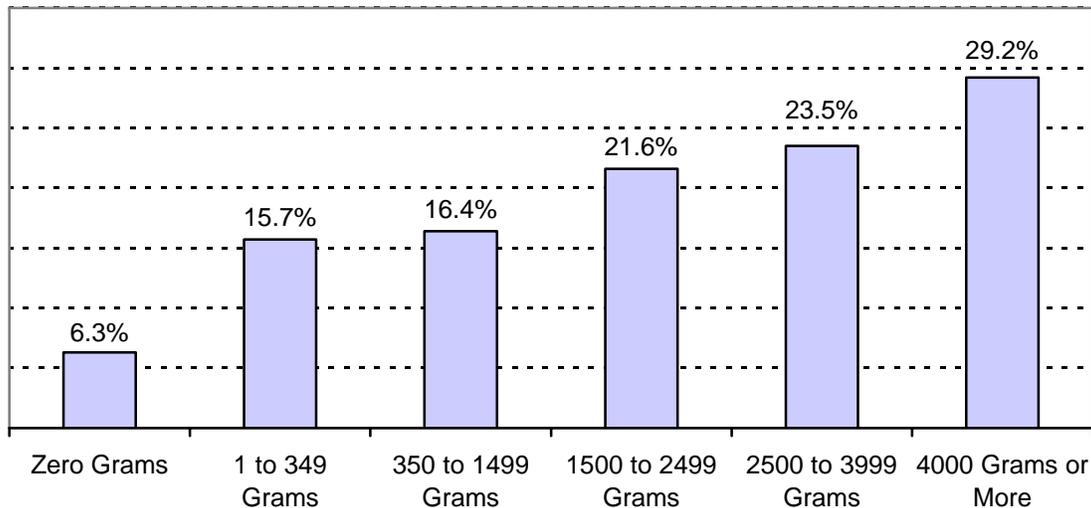
Figure 8. Percent of Stillbirths Autopsied Within Each County, Arizona 2000-2004



The proportion of autopsies was also analyzed by race, ethnicity, gestational age, and reported weight of the fetus. In terms of race and ethnicity, the percentage of stillbirths of Non-Hispanic women that were autopsied was 19.1 percent compared to 17.2 percent of stillbirths to Hispanic women. The proportion of autopsies for stillbirths of White (21.0 percent) and Asian (19.0 percent) women were higher than for stillbirths among African American (12.4 percent) and American Indian women (10.7 percent). Fewer stillbirths occurring before 25 weeks gestation were autopsied (12.7 percent) than stillbirths occurring after 25 weeks (22.2 percent).

Figure 9 shows the percent of stillbirths that were autopsied by reported gestational weight. As the reported gestational weight increased, the percent of stillbirths autopsied also increased with just 6.3 percent of stillbirths weighing zero grams being autopsied compared to 29.2 percent of stillbirths weighing 4,000 grams or more.

Figure 9. Percent of Stillbirths Autopsied by Weight, Arizona 2000-2004



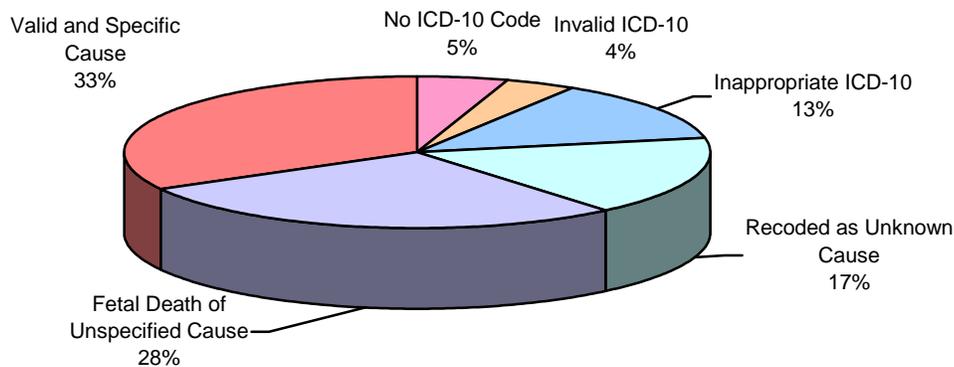
CAUSE OF DEATH

As reported in *Incidence and Causes of Stillbirth, 2003*, the cause of stillbirth often remains unknown, even when a concerted effort is made to determine the cause of death. Currently, in Arizona, three causes of death can be entered onto the fetal death certificate – a primary cause of death and two contributing factors. Since 2000, the cause of death has been coded using ICD-10 codes in Arizona. Currently, this coding is completed by Arizona Department of Health Services Vital Records staff. The staff person responsible for coding fetal deaths reviews a hard copy of the fetal death certificate and, using all three fields on the death certificate, makes a determination of the most appropriate ICD-10 code. From 2000 through 2004, there were over 170 distinct ICD-10 codes used to classify cause of death in the fetal death certificate data. In order to group these causes into classifications for this report, a pediatrician from the Arizona Perinatal Trust reviewed the ICD-10 codes and their associated descriptions. The pediatrician then classified the deaths into categories based on their similarities and potential prevention efforts.

Figure 10 shows causes of stillbirths for the 2000 through 2004 reporting period. As is true in many studies on the causes of stillbirths, the cause of death was unknown in the majority of stillbirths for this time period. In many cases, the lack of a definitive cause of death may be the result of data reporting issues. Five percent of the stillbirths reviewed for this report did not have an ICD-10 code listed in the fetal death file, 4 percent had invalid ICD-10 codes, 13 percent had inappropriate ICD-10 codes, and 17 percent were reclassified as an “unknown cause” because the ICD-10 code listed in the death certificate file did not appear to be a valid ICD-10 code for a fetal death. Another 28 percent of the stillbirths

were coded with an ICD-10 code of P95, or “fetal death of unspecified cause”. The remaining 33 percent of fetal deaths had ICD-10 codes indicating valid and specific causes of fetal deaths.

Figure 10. Causes of Stillbirths, Arizona 2000-2004



Of the 33 percent of fetal deaths with a known cause of death, the most common cause was cord problems (31 percent) followed by malformations (23 percent), placenta disorders (18 percent) and hypoxia (6 percent). Cardiovascular disease, hydrops fetalis or isoimmunization, and infection or inflammation each accounted for 3 percent of the cases where cause of death was known. “Other causes” was listed for the remaining 13 percent.

Although it is generally believed that autopsies can provide more specific information regarding cause of death, stillbirths that were autopsied were no more likely to have a known cause of death than those that were not autopsied. As with all stillbirths, only 33 percent of autopsied cases in the 2000 through 2004 files had ICD-10 codes indicating a known, specific cause of death. Thirty-eight percent of autopsied stillbirths were classified with an ICD-10 code of P95, or “fetal death of unspecified cause”. As with all stillbirths in the 2000 through 2004 fetal death files, the most common cause of autopsied stillbirths reported was cord problems (25 percent) followed by malformations (21 percent) and placenta disorders (15 percent).

DATA QUALITY

When the Incidence and Reported Causes of Stillbirths 2003 Report was presented to the Unexplained Infant Death Council in April of 2005, there were many concerns regarding the quality of the data. The Council recommended that

the second annual stillbirth report include an analysis of the quality of the data including a review of problematic fields by facility or hospital.

In response to the concerns regarding data quality and the Council's recommendations, a number of data elements were analyzed for data quality. The analysis consisted of a review of frequencies of selected variables to determine the percentage of cases with out-of-range, invalid, and missing values. Fields were chosen for this analysis based on the likelihood that they would be used in an analysis of stillbirths. In addition to reviewing frequencies as described above, the data was reviewed to determine if the cases included in the fetal death files were appropriate for an analysis of fetal deaths.

CASE INCLUSION

ARS 36-2291 stipulates that a report on the incidence and causes of stillbirth should be produced each year for stillbirths occurring at or after 20 weeks gestation. Fetal weights and reported gestational age were reviewed to determine if all records included in these files would be appropriate for a report on the incidence and causes of stillbirths. Of the 2,698 cases reported in these files, seven did not have data in the reported gestational age field. All seven of these cases had a weight of at least 350 grams indicating that they most likely were of an appropriate gestational age for inclusion. The remaining 2,691 cases had reported gestational ages of 20 weeks or more. However, the calculation of gestational age (comparing the date of death to the date of the last menstrual period) indicated that 2 percent (n=62) of the cases had gestational ages less than 20 weeks and perhaps should not have been included. Half of these cases also had reported weights under 350 grams.

The reported weight was also reviewed to determine whether or not the case was appropriate for inclusion of an analysis of incidence and reported causes of fetal deaths. Five percent of the cases (n=142) were reported to weigh zero grams and another 16 percent (n=427) were reported to weigh less than 350 grams. Weight for all 32 cases from one non-birthing facility was listed as zero grams. In conclusion, it appears that some cases included in this analysis of the incidence and causes of stillbirths may be inappropriately included. Data quality issues make it impossible to determine exactly how many should have been excluded, however it appears to be less than 20 percent based on an analysis of calculated gestational ages and reported birth weights.

QUALITY OF SELECTED DATA FIELDS

As stated above, fields for data quality review were based on their likelihood to be included in an analysis of the incidence and causes of stillbirths. Demographic, risk factor, maternal and fetal characteristics, and ICD-10 coded

cause of death were included in the data quality analysis. Quality of both maternal demographic characteristics and risk factor data did not appear to be of concern.⁴ The two fields that were exceptions were maternal education, for which 5 percent of cases were coded as “unknown” and maternal ethnicity, which was missing in 15 percent of the cases. When these two fields were analyzed by facility, data quality varied from facilities with no missing data to facilities that had 63 percent of all cases reporting maternal education as unknown.

RECOMMENDATIONS FOR FURTHER STUDY

Based on the findings of this report, suggested future directions for study include determination of when an autopsy is suggested, determination of appropriate cut-off weight for inclusion in analysis, better classification of causes of death, and continued monitoring of progress on data quality efforts to facilitate quality assurance.

⁴ Tobacco and alcohol use were not analyzed for this report.

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